MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2016/2017

EEN1026 – ELECTRONICS II

(All Section / Groups)

24 FEBRUARY 2017
3.00 p.m – 5.00 p.m
(2 Hours)

INSTRUCTION TO STUDENT

1. This Question paper consists of 6 pages including cover page with 4 Questions only.
2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.
4. State all the assumptions clearly.

Question 1

(a)

(i) What is the significant difference between the construction of an enhancement-type MOSFET and a depletion-type MOSFET?

[4 marks]

(ii) Sketch a p-channel enhancement-type MOSFET with the proper biasing applied ($V_{DS} > 0$ V, $V_{GS} > V_T$) and indicate the channel, the direction of electron flow, and the resulting depletion region.

[6 marks]

(b) The inverting schmitt trigger circuit is shown in Figure Q1 (b). Determine the upper threshold point (UTP) and lower threshold point (LTP) values. The values of the resistors are $R_1 = 20k\Omega$, and $R_2 = 10k\Omega$. Sketch the input and output waveform.

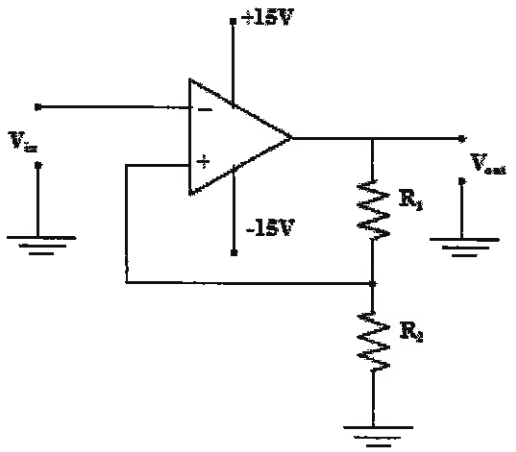

Figure Q1 (b)

[8 marks]

(c) The free running multivibrator as shown in Fig. Q1 (c) has the following parameters: $V_{CC} = 15V$, $R_A = 10k\Omega$, $R_B = 22k\Omega$, $C = 0.001\mu F$. Calculate the operating frequency, duty cycle, and the pulse width values.

[7 marks]

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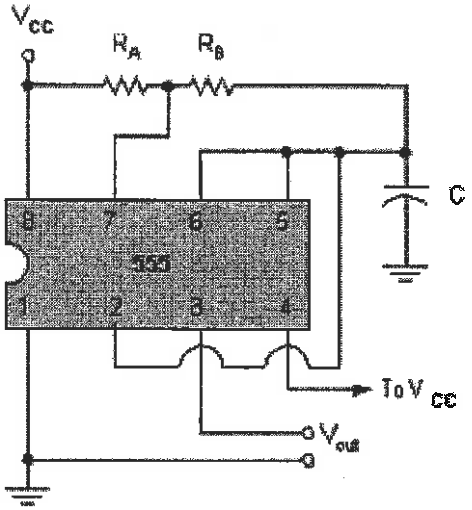

Fig. Q1 (c)

Question 2

(a) The fixed-bias configuration shown in Fig. Q2 (a) has defined operating point values as V_{GSQ} = -2 V and I_{DQ} = 5.625 mA, with an applied input signal V_i. The other values are I_{DSS} = 10mA, V_P = -8V, V_{DD} = 20V, R_D = 2kΩ, R_G = 1MΩ, V_{GG} = 2V and amplification factor μ = 75.5. Determine the following:

(i) trans conductance, g_m [3 marks]

(ii) drain resistance, r_d [3 marks]

(iii) input impedance, Z_i [3 marks]

(iv) output impedance, Z_o [3 marks]

(v) voltage gain, A_v [3 marks]

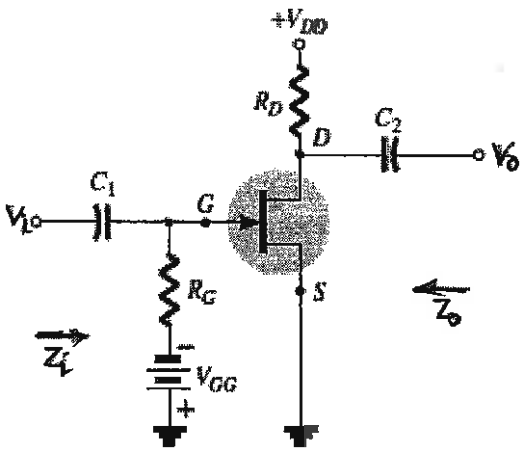

Fig. Q2 (a)

Continued...

(b)

(i) A common-source amplifier circuit is shown in Figure Q2 (b). Draw the high-frequency small-signal equivalent circuit by considering the transistor parasitic capacitances for the amplifier and explain the necessity for the inclusion of parasitic capacitances in the model.

[6 marks]

(ii) Apply Miller theorem to the circuit in part (b) (i) and draw an equivalent circuit.

[4 marks]

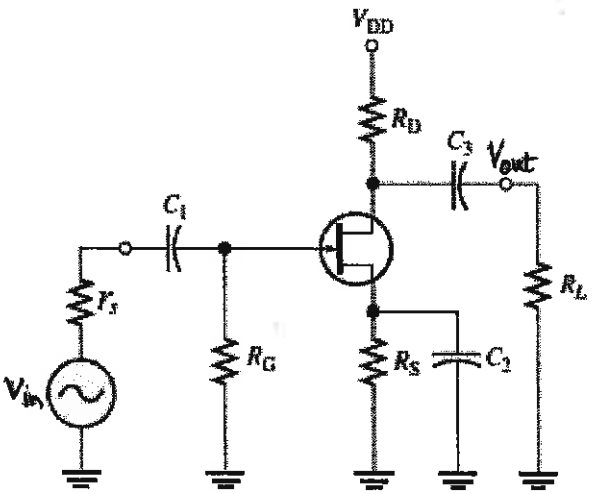

Fig. Q2 (b)

Question 3

(a) A transformer-coupled class A amplifier drives a 16Ω speaker through a 3.87:1 transformer. Using a power supply of V_{CC} = 36 V, the circuit delivers 2 W to the load. Calculate the following:

(i) P(ac) across transformer primary.

[0.5 mark]

(ii) V_L(ac).

[1.5 marks]

(iii) V(ac) at transformer primary.

[4 marks]

(iv) The rms values of load and primary current.

[4 marks]

(b) Calculate the harmonic distortion components for an output signal having fundamental amplitude of 2.1 V, second harmonic amplitude of 0.3 V, third harmonic component of 0.1 V, and fourth harmonic component of 0.05 V.

[6 marks]

(c) A class C amplifier shown in Fig. Q3 (c) the transistor is ON for 10 percent of the input cycle. If V_{CC} = 12, $V_{ce(sat)}$ = 0.18V and $I_{c(sat)}$ = 25mA, L = 10 mH and C = 0.001μF. Calculate the following:

Continued...

(i) the average power dissipation for maximum output.

[3 marks]

(ii) the resonant frequency of a tank circuit.

[3 marks]

(iii) maximum peak-to-peak output voltage.

[3 marks]

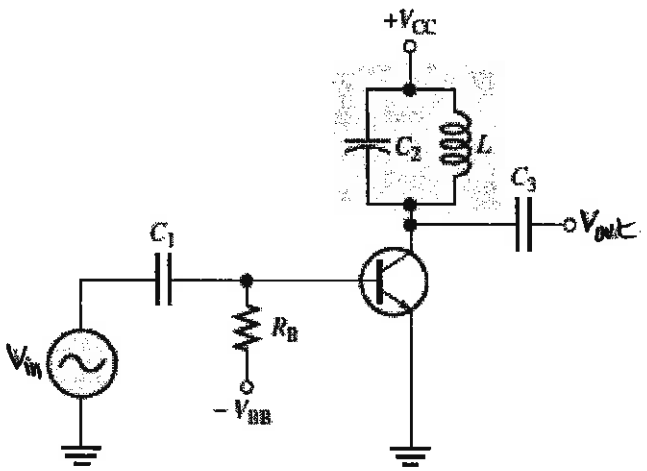

Fig. Q3 (c)

Question 4

(a) Suppose you are measuring the frequency response of an amplifier with a signal source and an oscilloscope. Assume that the signal level and frequency are set such that the oscilloscope indicates an output voltage level of 5 V rms in the midrange of the amplifier's response. If you wish to determine the upper critical frequency, indicate what scope indication you would look for.

[2 marks]

(b) Determine the approximate bandwidth of an amplifier from the indicated results of the step response test shown in Fig. Q4 (b).

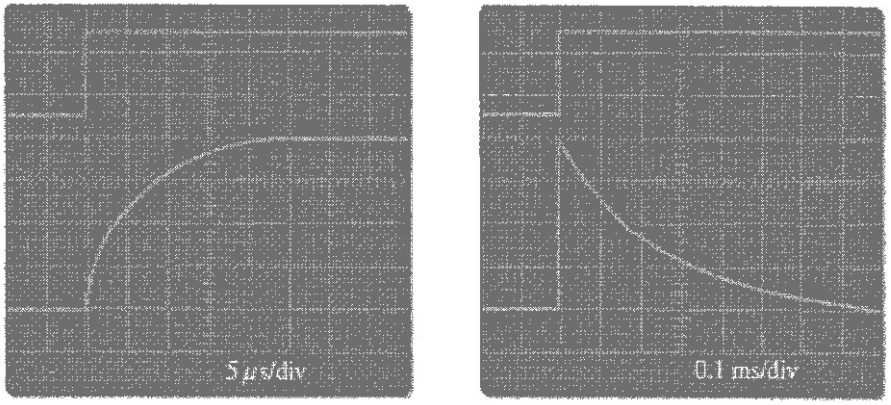

Fig. Q4 (b)

[9 marks]

Continued...

(c) For the cascaded system shown in Fig. Q4 (c) with two identical stages, determine the following:

(i) the loaded voltage gain of each stage. [3 marks]

(ii) the total gain of the system. [4 marks]

(iii) the current gain of each stage at full load. [2 marks]

(iv) the total current gain of the system. [2 marks]

(v) how Z_i is affected by the second stage and R_L. [1 mark]

(vi) how Z_o is affected by the first stage and R_s. [1 mark]

(vii) phase relationship between V_o and V_i [1 mark]

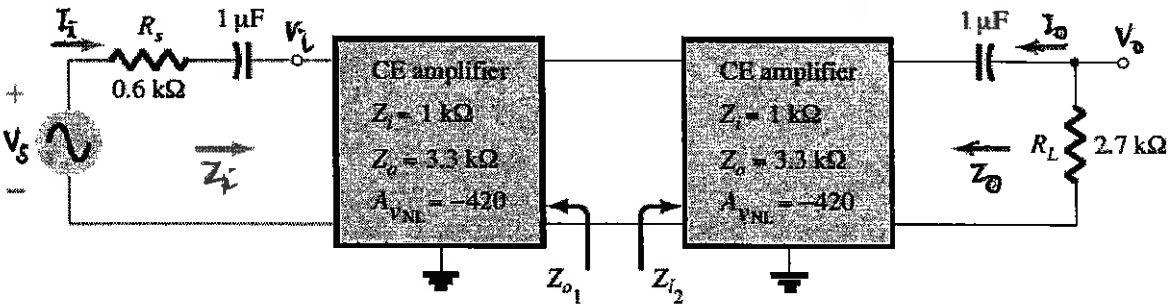

Fig. Q4 (c)

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